



Paper Code : CHEHCT 11

M.Sc. I Semester Degree Examination, June/July 2023

Subject : CHEMISTRY (CBCS Scheme)

Paper : Inorganic Chemistry – I

Time : 3 Hours

Max. Marks : 80

1. Answer **any eight** of the following questions.

(8×2=16)

- Ionic crystals are hard and brittle. Why ?
- What are n and p-type semiconductors ?
- Point out the shortcomings of crystal field theory.
- What do you mean by Lewis Acid-Base theory ?
- Write the preparation of metal nitrosyl.
- What is levelling effects of solvents ? Give examples.
- What is steric factor ? Mention its influence on reactivity.
- Aqueous MnO_4^- solution is intensely colored while MnCl_2 solution is nearly colorless. Account for this.
- Compare between the diamagnetism and paramagnetism.
- Depict the trigonal antiprismatic structures.

2. a) Why is molecular orbital theory is preferred to explain the metal-ligand bond theory ? Give the MO diagrams of triatomic molecule CO_2 .

b) Derive Born-Landé equation for the lattice energy of NaCl solid.

c) Derive Kapustinskii equation. How it is useful to calculate the polarizability character of the solids ?

OR

c) Write at least four postulates of Valence Shell Electron Pair Repulsion (VSEPR) theory. Discuss the structure of IF_7 , ClF_3 and XeF_6 using valence bond theory of bonding.

(5+5+6)

P.T.O.





3. a) Describe the high nuclearity carbonyl clusters of Fe, Ru and Os group.
- b) Give the isoelectronic and Isolobal relationship in carbonyl clusters.
- c) Write a note on chalcogenide clusters and octahedral metal halides.

OR

- c) With illustrative examples, give the structure and any two reactions of metal dinitrogen complexes. (5+5+6)
4. a) Draw the combinations of ligand orbital which overlap with central metal orbital in σ and π bonding in octahedral stereochemistry.
 - b) What is magnetic susceptibility ? Explain how this is measured by Faraday's method.
 - c) Discuss briefly on spin-orbit coupling and quenching of orbital momentum.

OR

- c) What is Jahn-Teller distortion ? Discuss its consequences in transition metal complexes. (5+5+6)
5. a) Discuss a Pearson's concept of hard and soft acids and bases, give examples for hard acids and hard bases.
 - b) Illustrate on the measurement of Acid-Base strength.
 - c) Explain 'auto ionisation' and solvolysis reaction in liq. N_2O_4 and H_2SO_4 .

OR

- c) Describe the Acid-base titrations and give the titration curve for carboxylic acids and amines. (5+5+6)
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Paper Code : CHEHCT 12

M.Sc. First Semester (CBCS) Degree Examination, June/July 2023

Subject : CHEMISTRY

Paper : Organic Chemistry – I

Time : 3 Hours

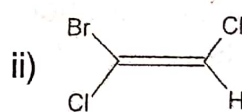
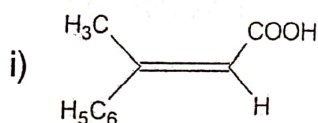
Max. Marks : 80

PART – A

1. Answer any 8 of the following :

(8×2=16)

- Define the terms : Cross and Hyper conjugation.
- What are the criteria for the compound to be aromatic ?
- What are homolytic and heterolytic cleavages ?
- What are Ylides ? Give an example.
- Define the terms enantiomers and diastereomers with examples.
- Assign E or Z nomenclature to the following compounds :



- Write the mechanism of Benzil-Benzilic acid rearrangement.
- What is Dakin's reaction ?
- Write the Dakin's reaction and give its importance.
- Define optical isomerism with example.

PART – B

2. Answer the following questions :

- Give account on :
 - Hybridization index
 - Valence tautomerism.
- Briefly explain the concept and classification of hydrogen bonding.
- Explain the concept of homo-aromaticity, non-aromaticity and anti-aromaticity with suitable examples.

OR

- Discuss the aromaticity of annulenes and hetero-annulenes.

(5+5+6=16)

P.T.O.





3. a) Discuss any two methods used for the determination of reaction mechanism.
b) With suitable example, explain classical and non classical carbocations.
c) What are reactive intermediates ? Discuss the stability and reactivity of free radicals.

OR

- c) Outline the mechanism of SN^1 and SN^2 reactions. (5+5+6=16)

4. a) Write a note on R/S nomenclature.
b) Discuss the conformational analysis of Cyclohexane.
c) Give an account on Fischer projection and Newman projection formulae.

OR

- c) Give an account on Curtin-Hammett principles with example. (5+5+6=16)

5. a) Explain Wagner-Meerwein rearrangement with suitable example.
b) Outline the mechanism of Pinacol-Pinacolone rearrangement.
c) Write briefly on the molecular rearrangements Hofmann, Lossen and Beckmann rearrangements.

OR

- c) Give a detailed account of the O-C bond migration of Baker-Venkataraman rearrangement. (5+5+6=16)



Paper Code : CHEHCT 13

M.Sc. I Semester (CBCS) Degree Examination, June/July 2023

Subject : CHEMISTRY

Paper : Physical Chemistry – I

Time : 3 Hours

Max. Marks : 80

Instructions : 1) *All questions are compulsory.*
2) *All questions carry equal marks.*

1. Answer **any eight** of the following : (8×2=16)
- a) State Heisenberg's uncertainty principle.
 - b) What is photoelectric effect ?
 - c) Define Hermitian operator.
 - d) Give concepts of acids and bases.
 - e) Define number average molecular weight of polymers.
 - f) Define glass transition temperature (T_g) and melting temperature (T_m).
 - g) Comment briefly steady state approximation with example.
 - h) Differentiate primary and secondary salt effects.
 - i) Define degree of polymerization. Give examples.
 - j) Write short note on multiplication operators.
2. a) Give postulates of quantum mechanics. 5
b) Derive Schrödinger wave equation for particle in one dimensional box. 5
c) Describe Hamiltonian operator with its properties. 6
- OR
- c) Write a note on Krenneckers delta. 6
3. a) Discuss dipole-dipole interactions. 5
b) Derive Handarson Hassalback equation for buffer solution. 5
c) Discuss Cetenanes and Rotaxanes. 6
- OR
- c) Discuss Debye-Huckle limiting law. 6

P.T.O.





- 4. a) Discuss networking in polymers. 5
- b) Explain, determination of molecular weight by Osmotic pressure method. 5
- c) Discuss the applications of polymers in preparing artificial heart and dental fixtures. 6

OR

- c) Discuss molecular weight distribution in polymers. 6
- 5. a) Write notes on Maxwell's relations. 5
- b) Explain collision state theory for bimolecular reaction rates. 5
- c) Describe Flash photolysis method for dynamics of fast reactions. 6

OR

- c) Explain Hinshelwood theory of unimolecular reaction. 6
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Paper Code : CHESCT 11

M.Sc. I Semester (CBCS) Degree Examination, June/July 2023

Subject : CHEMISTRY

Paper : Analytical Chemistry – I

Time : 3 Hours

Max. Marks : 80

1. Answer **any eight** sub-divisions.

(8×2=16)

- a) The weighing scale shows that person weighs 74 kg but actual weight is 76.5 kg. Find the absolute and percentage error of this measurement.
- b) Write the significant figures of the following numbers ; 125630, 0.01230, 0.00060, 100630.
- c) What is coning and quartering method in solid sampling ?
- d) List out factors affecting solvent extraction system.
- e) Give the basic difference between HPLC and GC.
- f) What is drug ? How does it differ from medicine ?
- g) What is chemical preservative ? Give example for inorganic and organic preservatives.
- h) What is food additive ? Give example.
- i) Give the difference between reference electrode and glass electrode.
- j) What is conductance ? Write the conductometric titration curve of strong acid v/s weak base.

2. a) Briefly discuss about the classification of errors and their minimization.
- b) Write a note on measure of precision and variability of analytical data.
- c) What is sampling ? Explain different types and methods of sampling.

OR

Explain the significance of t-test. A chemist analysed curry leaves for iron content using a new method and obtained the following results : 22.4; 22.8; 22.5; 21.2 mg. If the theoretical value is 20.5 mg. Find whether there is any significant difference between new method and standard method (Given t-value at 95% CL = 3.18)

(5+5+6=16)

P.T.O.





3. a) Enumerate the principle and methods of ion exchange chromatography.
- b) i) When 200 mg of iodide was extracted from 100 mL of an aqueous solution with 50 mL portions of carbon tetrachloride, the first lot contained 4.6 mg while second extraction with 50 mL of the carbon tetrachloride had extracted species as 0.1057 mg. What is the amount of iodine remaining unextracted in the aqueous phase if it was extracted with 100 mL of organic solvent with $D = 85$?
- ii) What is synergetic extraction ? Explain with a suitable example.
- c) Sketch the schematic diagram of HPLC and explain the function of its components and operations.

OR

- i) Discuss the instrumentation and columns of gas chromatography.
- ii) Give the comparison of GSC and GLC. (5+5+6=16)
4. a) Briefly discuss on the source of drugs and their analysis.
- b) How do you select an ideal food preservative ? Give method for the detection of any two preservative.
- c) Explain with a suitable example for analysis of anesthetics and sedatives.

OR

Discuss the general method for the determination of moisture, crude fiber and ash content of foods. (5+5+6=16)

5. a) What is ion selective electrode ? Explain its applications in potentiometry.
- b) Describe the cyclic voltammogram of $K_4[Fe(CN)_6]$ system.
- c) i) Distinguish between constant current and control potential coulometer.
- ii) Give the quantitative applications of polarography.

OR

Write a note on the following :

- i) Voltammetry and its quantitative applications.
- ii) Conductometric titration and its applications. (5+5+6=16)